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Case report of a dog with chronic kidney disease fed a homemade diet

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Introduction

Chronic kidney disease (CKD) might have different causes like birth defects, inflammation (pyelonephritis), immune system associated diseases (glomerulonephritis) or intoxications which lead to damage of the kidney's tissue. An impaired kidney function leads to a decreased clearance of the blood from metabolites usually excreted via urine (e.g. urea, creatinine). Proteinaceous catabolites accumulate in the blood (azotaemia). Clinical findings depend on severity of renal failure and include polyuria, polydipsia, lethargy, weakness, reduced appetite, weight loss and vomiting. Clinical examination might reveal poor hair coat, weight loss or cachexia, dehydration, pallor and oral ulceration. Possible abnormalities found in blood analysis and urinalysis are azotaemia, hyperphosphataemia, non-regenerative anaemia, proteinuria and decreased urinary specific gravity. Clinical treatment of patients with CKD includes rehydration and consecutively ensure sufficient fluid intake, adjustment of the acid-base balance and increase of the renal clearance. To limit the metabolic production of azotaemic substances and preserve the healthy tissue of the kidney, the dietary management of renal failure includes restricted supply of phosphorus and protein. Reducing the supply with nonessential proteins and preferably feeding protein sources with a high digestibility and bioavailability ensures the fulfilment of the need for proteins and single amino acids (Devaux et al., 1996). An adequate energy supply prevents from body mass depletion which usually also includes loss of muscles and increase metabolic stress which promotes further kidney damage. Feeding a highly palatable, energy dense diet is of particular importance as decreased food intake or anorexia are common symptoms associated with CKD (Bartges 2012).

Clinical history

A dog, Chihuahua, 4 years old with an actual body weight of 2.9 kg (ideal) was presented to a private veterinarian due to a history of anorexia, emesis, polydipsia and polyuria for three days (day 0, D0). Blood analysis (table 1) revealed an uraemia and increased SDMA (symmetric dimethylarginine). An additional ultrasound examination of the abdomen lead to the diagnosis of a CKD. The dog was treated with antacid (Ranitidine) and antibiotics (Cefovecin, Metronidazole). The follow-

ing day the owners travelled with the dog to Spain (D1). As feed intake did not improve, force feeding was started by the owners with a canned diet with a high energy density (474 kJ per 100 g; D2). The dog was brought to a local veterinary practice on D4 as the symptoms did not improve. Due to the blood values (table 1) the dog stayed in the clinic until D6 for an infusion therapy. The symptoms did not improve afterwards despite the dog received prednisone (1 mg/day), therefore the local veterinarian was visited again (D10). Creatinine, urea and phosphorus blood levels were markedly increased. The diet was changed to a commercial kidney diet. Within five days the symptoms and the blood values improved (D15) but creatinine and urea did not totally normalize and a urinary protein creatinine quotient of 6.77 (Ref.: <0.5) revealed a proteinuria (D27). The dog showed appetite but refused to eat the commercial kidney diet probably because he was used to eat a homemade diet previous to the diagnosis, which made force-feeding still necessary. The dog lost weight (2.4 kg; -0.5 kg; -17%). Therefore the owner contacted the nutrition consultation service of the Institute of Animal Nutrition at the University of Zurich for a recommendation of a homemade renal diet.

Table 1: Blood analysis (varying laboratories with different reference values are highlighted and written in different rows)

	Reference	D0	D4	D6	D10	D15	D 27	D86	D200
SDMA (ug/dl)	<15	26					21	13	22
Urea (mmol/l)	2.5-9.6	22.7	22.2	23.0			14.2	14.3	12.9
	1-4.3				13.2	4.1			
Creatinine (umol/l)	44-159	191	130	111			187	154	172
	35-141				203	141			
Albumin (g/l)	23-40	22					24		
	26-46				16	18			
Phosphorus (mmol/l)	0.84-2.19						1	0.78	0.84
	0.8-2.2				4.3	0.16			

Dietary approach

The recommended diet was based on fatty pork providing energy from fat and essential amino acids from animal protein with a high bioavailability. Protein intake was limited to the minimum recommendation. Sweet potatoes provided energy as well as corn oil and salmon oil. Salmon oil contains potential anti-inflammatory omega 3 fatty acids (eicosapentaenoic acid and docosahexaenoic acid; Brown et al., 2000). The fat content of the diet was with 32% of the dry matter (DM) within an appropriate range for dogs. Pectins (water soluble, fermentable plant fibre) from carrots were included

to support the intestinal health, particularly the gut microbiota. Mineral and vitamin requirements were met by supplementing the diet with a vitamin-mineral- mix, calcium carbonate and a commercial product for B-vitamin supply (table 2). Previous use of a phosphate binder was stopped, as blood phosphorus levels were within normal levels after limiting dietary phosphorus supply to the recommended amount (table 1). The owner was instructed to feed the diet cooked, properly mixed and evenly distributed to minimum three portions fed during the day. The importance of consequently sticking to the dietary recommendation and ensuring sufficient water intake to prevent the kidney from further damage as good as possible was pointed out. An adequate diet is able to retard progressive damage to the kidney but as already damaged kidney tissue cannot heal, the diet has to be fed for the rest of the dog's life. Nutrient contents of the feedstuffs used for a homemade diet may vary e.g. due to different origin, harvest and storage time. Therefore frequent follow-up analyses of the blood and urine by the private vet were recommended to immediately adapt the diet in case of aggravation of the patient's blood values and symptoms.

Table 2: Recommended allowance for a dog with 2.9 kg body weight for dietary treatment of a CKD and daily nutrient supply with a high energy diet, a commercial kidney diet, a recommended kidney diet and an adapted kidney diet to the occurrence of a pancreatitis

	Recommended allowance	Evaluation of the high energy diet	Evaluation of the comm. kidney diet	Recommended kidney diet	Recommended diet CKD & pancreatitis
Energy (MJ ME)	1.2	0.8	1.1	1.2	1.3
CP	7	16	8	7	8
Ca (g)	0.29	0.44	0.46	0.33	0.31
P (g)	0.17	0.42	0.1	0.17	0.18
Mg (mg)	0.04	0.03	0.08	0.07	0.09
K(g)	0.3	0.42	0.2	0.65	1.1
Na (mg)	0.06	0.31	0.12	0.08	0.08
Vit A (IE)	365	5246	3640	410 + betacarotene	222 + betacarotene
Vit D (IE)	39	62	120	50	39
Vit E (mg)	2	44	28	12	14

Follow up and discussion

The dog was able to keep the blood levels stable and increased the body weight slowly back to the ideal weight of 2.9 kg. The symptoms worsened again on D235 (emesis, anorexia). An acute pan-

creatitis was diagnosed by the private veterinarian and treated with infusions, an antibiotic and an anti-emetic drug. Prevalence of a pancreatitis might be increased in patients with CKD (Cook et al., 1993). Dietary recommendations for a patient with pancreatitis include among others a highly digestible low fat diet, providing support of the intestinal microbiota by an adequate fibre supply. The diet needs to be fed cooked, distributed into many small portions during the day. The diet was adapted by increasing the energy supply from carbohydrates (sweet potato) and decreasing the fat supply with the diet (13% DM; table 2). The owner was advised by the private veterinarian to mix pancreatic enzymes with the food previous to feeding to increase the digestibility of the diet. As the dietary adaption was done recently only, further blood values are not available yet.

Conclusion

Feeding a homemade diet to a dog with CKD can improve the symptoms and if the dog is used to eat a homemade diet it is much easier. The owner compliance needs to be very good. However, frequent follow-up evaluations are necessary to adapt the homemade diet on time to the patient's individual requirements. It has to be considered that complications like a pancreatitis might occur.

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